

Prevalence of Depressive Symptoms in the Nursing Workforce in Pakistan: Systematic Review and Meta-Analytic Evidence

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Abstract

Introduction: Nursing involves demanding clinical responsibilities and emotional challenges that may increase the risk of depressive symptoms and affect nurses' well-being and patient care. This study estimated the pooled prevalence of depressive symptoms among registered nurses in Pakistan and examined variations across regions and assessment instruments.

Methods: This systematic review and meta-analysis followed PRISMA guidelines. PubMed, Embase, Scopus, Web of Science, PsycINFO, and Pakistan-based databases were searched. Eligible studies reported the prevalence or severity of depressive symptoms among registered nurses in clinical settings using validated or clearly described assessment tools. Two reviewers conducted data extraction and quality assessment using the Joanna Briggs Institute checklist. A

random-effects model was used to estimate pooled prevalence. Subgroup analyses were performed by region and assessment instrument, and meta-regression assessed temporal trends.

Results: Twenty-two studies involving 3,190 nurses were included. The pooled prevalence of depressive symptoms was 49% , with substantial heterogeneity ($I^2 = 97\%$). Prevalence varied by assessment instrument, ranging from 38% with the PHQ-9 to 61% with the DASS-21. Regional analyses indicated higher prevalence estimates in Khyber Pakhtunkhwa than in other provinces. Meta-regression showed no significant association between publication year and prevalence estimates. Although Egger's test suggested possible funnel plot asymmetry, Trim-and-Fill analysis did not indicate substantial publication bias.

Conclusion: Depressive symptoms are highly prevalent among nurses in Pakistan and represent a major occupational mental health concern. Interventions to improve working conditions and organizational support, along with standardized assessment methods, may help reduce this burden and improve the consistency of future research findings.

Keywords: Prevalence, Nurses; Depressive symptoms; Pakistan; Systematic review

Introduction

Nurses work in demanding clinical environments where they provide continuous patient care, respond to changing clinical needs, and make timely decisions. Heavy workloads, substantial professional responsibilities, and frequent exposure to patient pain and suffering can place considerable psychological strain on nurses. Over time, these demands may affect their physical and mental well-being (Kakemam et al., 2019; Wang et al., 2023). The mental well-being of nurses is important not only for their own health but also for maintaining quality of care, patient safety, and healthcare system performance (Li et al., 2024). Depressive symptoms among nurses represent an important occupational mental health issue because they have been associated with decreased motivation, chronic fatigue, lower job satisfaction, reduced engagement, increased absenteeism, and a greater likelihood of leaving the profession, potentially contributing to nursing workforce shortages (Fei et al., 2023; Pang et al., 2020) .

Global evidence indicates that depressive symptoms are common among practicing nurses. A systematic review and meta-analysis of 102 studies involving 52,592 nurses in China reported a pooled prevalence of depressive symptoms of 43.83% (Xie et al., 2020).

In Pakistan, the mental health of nurses may be further affected by healthcare system constraints, including nursing staff shortages, high patient-to-nurse ratios (Ahmad et al., 2026), and limited organizational support. Previous studies have also suggested that workload (Ghanei Gheshlagh et al., 2025), occupational burnout, and workplace-related stressors may be associated with an increased risk of depressive symptoms among nurses (Mukhtar et al., 2026). These challenges are not unique to Pakistan and are also seen in nursing workforces in other countries. Examining depressive symptoms among nurses in Pakistan can add evidence from a less studied healthcare setting and help place the mental health challenges facing nurses within a wider international context (Organization, 2025) .

Previous studies have reported that depressive symptoms and psychological distress among nurses may negatively affect work performance, nurse–patient interactions, and patient-related outcomes (Melnyk et al., 2021; Pappa et al., 2023). In Pakistan, studies have also reported a high frequency of medication administration errors and workplace-related stressors among nurses (Ali et al., 2020; Rehman et al., 2025).

Despite the availability of individual studies examining depressive symptoms among nurses in Pakistan (Ali et al., 2018; Moazzam et al.), no previous systematic review or meta-analysis has comprehensively synthesized these findings. In addition, based on the authors’ review of the literature, potential variations in prevalence estimates across regions, time periods, and assessment instruments have not been systematically examined. Such variations may be important because differences in healthcare infrastructure, workplace conditions, and assessment instrument characteristics could contribute to heterogeneity in prevalence estimates across studies. Therefore, the aim of this systematic review and meta-analysis was to estimate the pooled prevalence of depressive symptoms among nurses in Pakistan and to examine differences by region and measurement tools.

Method

This systematic review and meta-analysis was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) under the registration number CRD420251178331. The conduct and reporting of this review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page et al., 2021), employing a structured four-stage process encompassing study identification, screening, eligibility appraisal, and final inclusion. The complete search strategy, including all controlled vocabulary terms (MeSH/Emtree), free-text keywords, and Boolean operators, is provided in Supplementary File 1.

A comprehensive and systematic search of the literature was undertaken across the following electronic databases: MEDLINE (via PubMed), Web of Science Core Collection, Embase, Scopus, APA PsycINFO, and Google Scholar. To enhance retrieval sensitivity and capture contextually relevant national evidence, additional manual searches were conducted within Pakistan-specific scholarly platforms, including the Pakistan Journal of Medical Sciences, the Journal of the Pakistan Medical Association, and the PakMediNet database. The search process was iterative and exhaustive, with the final search update completed in October 2025.

Based on the Condition–Context–Population (CoCoPop) framework (Munn et al., 2017), this review aimed to answer the following question: What is the prevalence of depressive symptoms among registered nurses working in clinical healthcare settings in Pakistan?

Condition (Co): Depressive symptoms assessed using validated or clearly described assessment instruments.

Context (Co): Clinical healthcare settings in Pakistan.

Population (Pop): Registered nurses or nursing staff employed in clinical healthcare settings.

Inclusion and exclusion criteria

Several inclusion criteria were defined for this review. First, participants were required to be registered nurses working in hospitals, primary healthcare settings, or specialized units in Pakistan. Second, studies had to report the prevalence of depressive symptoms or provide sufficient

quantitative data for extraction. The use of standardized and validated instruments for assessing depressive symptoms was preferred. However, studies using non-standardized or self-developed measures were also considered if they reported extractable prevalence data; these were included with caution and their potential impact on comparability was acknowledged. Only quantitative observational studies (cross-sectional, cohort, or case–control) were eligible. Additionally, studies had to be published in English or Urdu. Studies examining work-related or environmental factors such as job stress, workload, shift work, or workplace conditions were also included where relevant.

Studies that did not report nurse-specific data, or those presenting combined data for healthcare workers without allowing separate extraction for nurses, were excluded. Research that did not report depressive symptoms as an independent outcome and instead presented only composite psychological measures was also removed. Non-original articles, including narrative reviews, commentaries, letters, conference abstracts, and case reports, were excluded as well. Additionally, studies lacking sufficient information to calculate the prevalence or severity of depressive symptoms, or those with inaccessible full-texts, were not included. Unpublished, non–peer-reviewed, or informal sources were likewise excluded from the review

Study selection process

All search results were imported into EndNote software, and duplicate records were automatically removed. Study screening was conducted in two sequential phases. In the first phase, two reviewers (XX, XX), both proficient in English and Urdu, independently examined the titles and abstracts of all retrieved records to assess their relevance to the research question. In the second phase, the full texts of studies that met the initial eligibility criteria were reviewed in detail to determine their final inclusion. Any disagreements between the reviewers were resolved through discussion and, when necessary, by consulting a third reviewer (XX) to reach consensus. The overall study selection process is illustrated in the PRISMA flow diagram (Figure 1).

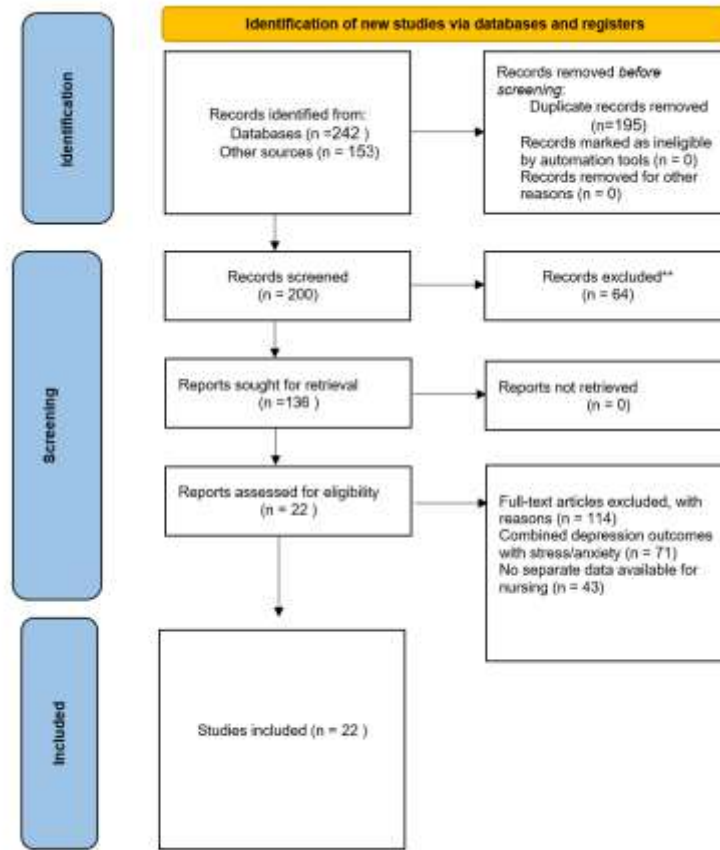


Figure 1: PRISMA flow diagram

Data extraction

Two reviewers (XX and XX) independently extracted data from all studies that met the inclusion criteria. The extracted information included the first author's name, year of publication, study setting and geographical region, total sample size, sample characteristics (e.g., gender distribution and mean age), depression assessment instrument used, cut-off score applied, and the reported prevalence or mean score of depressive symptoms. Where available, data on the severity levels of depressive symptoms (e.g., mild, moderate, severe) and study quality assessment scores were also recorded. Any disagreements during the data extraction process were resolved through discussion and consensus, and when necessary, a third reviewer (XX) was consulted

Depressive symptoms assessment instruments

Various validated instruments were utilized in the included studies to assess depressive symptoms among nurses in Pakistan. These instruments differed in their focus, scoring methods, and diagnostic criteria; however, they have been widely used and validated in clinical and research settings, particularly among healthcare-related populations. Their inclusion allowed for a broader evaluation of depressive symptoms across studies using commonly applied assessment tools

1. Patient Health Questionnaire-9 (PHQ-9)

The Patient Health Questionnaire-9 (PHQ-9) is a brief self-administered screening instrument derived from the DSM-IV criteria for depressive disorders. It consists of nine items assessing the frequency of depressive symptoms over the past two weeks, with each item scored from 0 (“not at all”) to 3 (“nearly every day”), yielding a total score ranging from 0 to 27. The PHQ-9 is primarily designed to assess the severity of depressive symptoms and to support case identification in clinical and research settings, rather than to establish a definitive clinical diagnosis. Standard cut-off points of 5, 10, 15, and 20 represent thresholds for mild, moderate, moderately severe, and severe depressive symptoms, respectively. A cut-off score of ≥ 10 is commonly used to indicate the presence of clinically relevant depressive symptoms, with reported sensitivity and specificity of approximately 88% for detecting major depression in validation studies. The PHQ-9 has demonstrated good criterion and construct validity, with a sensitivity and specificity of 88% at a cut-off score of ≥ 10 (Kroenke et al., 2001).

2. Beck Depression Inventory-II (BDI-II)

The Beck Depression Inventory-II (BDI-II) is a 21-item self-report instrument designed to assess the severity of depressive symptoms over the preceding two weeks (Beck et al., 1996), consistent with DSM-IV criteria. Each item is scored on a 4-point scale ranging from 0 to 3, yielding a total score between 0 and 63. The BDI-II is widely used as a measure of symptom severity in both clinical and research settings and has demonstrated strong reliability and validity across diverse populations. However, it is primarily intended as a screening and severity assessment tool rather than a standalone diagnostic instrument. Conventional score ranges are often used to categorize the severity of depressive symptoms (e.g., 14–19 mild, 20–28 moderate, and ≥ 29 severe), although cut-off values may vary depending on the study population and context. The BDI-II has demonstrated strong psychometric properties, with internal consistency of approximately 0.90 and

test–retest reliability ranging from 0.73 to 0.96 across different populations (Wang & Gorenstein, 2013).

3. Hamilton Depression Rating Scale (HAM-D / HDRS)

The Hamilton Depression Rating Scale (HAM-D or HDRS) is a clinician-administered instrument developed to assess the severity of depressive symptoms in individuals with established depressive disorders. It consists of multiple items evaluating mood, guilt, suicidal ideation, insomnia, anxiety, and somatic symptoms, with items scored on either 3- or 5-point scales. The HAM-D is primarily used to quantify symptom severity and monitor changes over time, particularly in clinical and hospital settings, rather than to establish an initial diagnosis. Higher total scores indicate greater severity of depressive symptomatology. Due to its clinician-administered nature and focus on somatic and neurovegetative features, the HAM-D has been widely used in clinical research, especially in inpatient or hospital-based populations. (Hamilton, 1960). The HAM-D has demonstrated acceptable reliability and validity, although its psychometric performance may vary across versions and modes of administration (Carrozzino et al., 2020).

4. Edinburgh Postnatal Depression Scale (EPDS)

The Edinburgh Postnatal Depression Scale (EPDS) is a 10-item self-report screening instrument originally developed to identify depressive symptoms in the postpartum period. Each item is scored on a 4-point scale (0–3), resulting in a total score ranging from 0 to 30. Although initially designed for postnatal populations, the EPDS has been validated and applied in a range of settings beyond the postpartum context. It is primarily used to screen for the presence and severity of depressive symptoms rather than to establish a clinical diagnosis. A cut-off score of ≥ 13 is commonly used to indicate the likelihood of clinically relevant depressive symptoms, although optimal thresholds may vary depending on the population and setting. The original validation study demonstrated satisfactory sensitivity and specificity and showed that the EPDS was sensitive to changes in depressive symptom severity over time (Cox et al., 1987). In the included study that used the EPDS, the participants were specifically pregnant nurses between 8 and 28 weeks of gestation.

5. Depression, Anxiety and Stress Scale-21 (DASS-21)

The Depression, Anxiety, and Stress Scale-21 (DASS-21) is a 21-item self-report instrument designed to assess three related dimensions of negative emotional states: depression, anxiety, and stress. Each subscale consists of seven items rated on a 4-point Likert scale (0–3), with subscale scores typically multiplied by two to maintain comparability with the original 42-item version. The DASS-21 is widely used as a screening and severity assessment tool in both clinical and non-clinical populations and has demonstrated good internal consistency and construct validity. It is not intended to provide a clinical diagnosis but rather to quantify the severity of symptom dimensions. In this review, only the depression subscale was considered to estimate the prevalence of depressive symptoms. Standard cut-off scores are commonly used to categorize severity levels; however, these thresholds may vary across studies and populations (Lovibond & Lovibond, 1995). The DASS-21 has demonstrated good reliability and construct and structural validity in Pakistani populations (Bibi et al., 2020).

6. STOP-D Scale

The Screening Tool for Psychological Distress (STOP-D) is a brief self-report screening instrument consisting of five single-item measures assessing key domains of psychological distress, including sadness (depression), anxiety, stress, anger, and social support.

The STOP-D is designed for rapid assessment in clinical and research settings, particularly where time-efficient tools are required. Each item functions as an independent indicator of symptom severity rather than forming a composite diagnostic scale. The instrument has demonstrated acceptable validity and reliability in previous validation studies and is primarily used to screen for the presence and severity of psychological distress, rather than to establish a clinical diagnosis. Higher scores on individual items reflect greater severity of the corresponding symptom domain, making the tool particularly suitable for high-demand or time-constrained environments. The STOP-D has demonstrated good concurrent validity, with its individual items showing strong correlations with corresponding established measures and robust receiver operating characteristic curves (Larsson et al., 2025).

7. General Health Questionnaire-28 (GHQ-28)

The General Health Questionnaire (GHQ), particularly the 28-item version (GHQ-28), is a self-administered screening instrument designed to detect general psychological distress and potential

psychiatric morbidity in community and clinical settings. It includes four subscales assessing somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression. The GHQ is intended to identify individuals with probable psychological distress rather than to establish formal psychiatric diagnoses. It focuses on deviations from normal functioning and the emergence of distressing symptoms over recent weeks. Scores are typically interpreted using threshold values to distinguish between likely cases and non-cases; however, these thresholds may vary depending on the study context and population. In this review, GHQ-based estimates were interpreted as indicators of depressive symptomatology rather than clinically diagnosed depression. The GHQ-28 has demonstrated acceptable validity as a screening measure, with its original four-factor structure replicated across independent samples (Goldberg & Hillier, 1979).

Quality assessment

The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) critical appraisal tool. This tool consists of nine items, each rated as "Yes," "No," "Unclear," or "Not applicable." A score of 1 was assigned to "Yes" responses, while all other responses received a score of 0. The total quality score for each study ranged from 0 to 8, and studies were categorized into three quality levels: low quality (score of 3 or less), moderate quality (score of 4 to 6), and high quality (score of 7 to 9) (Munn et al., 2023).

Data analysis

Statistical analyses were conducted using STATA version 17. Heterogeneity among the studies was assessed using the Cochran Q test and the I^2 index, with interpretation based on conventional thresholds. Heterogeneity levels were categorized as low (<25%), moderate (25-50%), substantial (50-75%), and very high (>75%). A random-effects model was used due to heterogeneity to calculate the pooled Prevalence of Depressive Symptoms, presented in a forest plot with 95% confidence intervals. The prevalence of depressive symptoms was extracted from the included studies based on the cut-off points reported in each article. In studies where cut-off values were not explicitly reported, the standard validated thresholds of the respective assessment instruments were applied according to established definitions of depressive symptom severity. No recalculation using raw data was performed. Given the variation in cut-off thresholds across different tools, full standardization was not feasible; however, all prevalence estimates were interpreted in accordance with the established scoring criteria of each instrument. Subgroup analyses were conducted by

depression measurement tool and geographic region to explore sources of heterogeneity. Meta-regression examined the impact of publication year on reported depressive symptom prevalence. Publication bias was assessed using funnel plots and Egger's test, with adjustment made using the Trim and Fill method if significant bias was detected.

Results

Study selection

A total of 395 records were identified through database searching (n = 242) and other sources (n = 153). After removing 195 duplicate records, 200 records remained for screening. During the title and abstract screening phase, 64 records were excluded, and 136 reports were sought for retrieval. All reports were successfully retrieved, and 22 full-text articles were assessed for eligibility.

A total of 114 full-text articles were excluded for the following reasons: combined reporting of depression with stress or anxiety outcomes (n = 71) and lack of separate data for nurses (n = 43). Finally, 22 studies met the inclusion criteria and were included in the systematic review and meta-analysis. The study selection process is presented in the PRISMA 2020 flow diagram (Figure 1).

Study characteristics

The systematic review included 22 studies comprising a total of 3,190 nurses working in clinical settings in Pakistan. Sample sizes varied considerably, ranging from 24 to 351 participants, with a mean sample size of 145 (SD = 87.9).

Regarding the assessment of depressive symptoms, the DASS-21 was the most frequently used instrument, applied in 8 studies (36.4%). The PHQ-9 was used in 4 studies (18.2%), while the BDI and HAM-D were each used in 2 studies (9.1%). Additionally, the EPDS, BDI-II, GHQ-28, and STOP-D were each utilized in one study (4.5%). One study employed a self-developed, non-validated questionnaire (Tariq et al.), and another did not report the measurement tool used.

Geographically, most studies were conducted in Punjab (n = 10, 45.5%), followed by Sindh (n = 6, 27.3%), Khyber Pakhtunkhwa (n = 4, 18.2%), and Baluchistan (n = 1, 4.5%). One study reported national-level data without specifying a particular province. A detailed summary of the included studies is presented in Table 1

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Author Year of Publication Location	Age (years) Mean± SD	Sample Size	Prevalence (%)	Male	Female	Study Quality	Instrument	Cut- off Point
Shafi(Shafi et al., 2025a) 2025 Punjab	NR	110	51.48	NR	110	High	EPDS	EPDS $\geq$ 10
Rehman(Rehman et al., 2025) 2025 KPK	28.± 4.4	237	36.7	NR	NR	Moderate	PHQ-9	PHQ-9 $\geq$ 10
Ali(Ali et al., 2024) 2024 Sindh	NR	351	64.67	NR	NR	High	BDI-II	NR
Akhtar(N. Akhtar et al., 2025) 2024 Sindh	NR	264	40.9	98	166	High	HAM-D	HAM-D $\geq$ 14
Ali(Ali & Nausheen, 2022) 2024 Sindh	NR	62	43.5	NR	NR	High	PHQ-9	PHQ-9 $\geq$ 10
Parveen(Parveen et al., 2024) 2024 Punjab	NR	130	18.5	NR	130	Low	NR	NR
Rasool(Rasool & Tareen) 2024 Baluchistan	36± 4.1	150	68	45	105	Moderate	DASS-21	NR

Tariq(Tariq et al.) 2023 Punjab	NR	100	56	17	80	Low	Self-developed	NR
Azeem(Azeem et al., 2023) 2023 Punjab	30.81 ± 6.5	128	57	80	48	Moderate	DASS-21	≥ 10
Altaf(Altaf & Bibi, 2023) 2023 Punjab	36 ± 4.1	150	64.6	45	105	High	DASS-21	≥ 10
Ali(Ali et al., 2023) 2023 KPK	NR	105	68.6	NR	NR	Moderate	BDI	≥17
Ali(Ali & Nausheen, 2022) 2022 Pakistan	NR	62	44	NR	NR	Moderate	PHQ-9	PHQ-9 ≥ 10
Andlib(Andlib et al., 2022) 2022 Punjab	27.7± 4.4	288	46	67	221	Moderate	STOP-D	Depression ≥ 4
Anwar(Anwar et al., 2022) 2022 Punjab	24.9± 3.6	306	73.8	NR	306	Moderate	DASS-21	≥ 10
Riaz(Riaz et al., 2021) 2021 Punjab	NR	24	4.2	NR	NR	Moderate	DASS-21	≥ 10
Amen(Amen et al., 2021) 2021 Sindh	NR	74	68	33	41	Moderate	DASS-21	≥ 10
Jan(Jan et al., 2021) 2021 KPK	NR	101	79	26	74	Moderate	DASS-21	≥10

Fatima(Fatima et al., 2020) 2020 KPK	NR	100	78	26	74	Moderate	DASS-21	> 10
Moazzam(Moazzam et al.) 2019 Punjab	27.88± 6.1	105	11.3	NR	NR	Low	BDI	≥ 21
Bilal(Bilal et al., 2018) 2018 Punjab	NR	120	45.8	NR	NR	Low	GHQ-28	24 ≤
Ali(Ali et al., 2018) 2017 Sindh	NR	154	36.3	60	47	Moderate	PHQ-9	PHQ-9 ≥ 10
Irfan(IRFAN et al., 2010) 2010 Sindh	NR	70	81.4	0	70	Low	HAM-D	Normal (<10), Mild (10–13), Moderate (14–17), and Severe (>17)

297 NR: Not Reported

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Meta-analysis

A total of 22 studies were included in the analysis. Given the substantial heterogeneity across studies, a random-effects model (DerSimonian–Laird) was applied. The overall pooled prevalence of depressive symptoms among nurses in Pakistan was 49% (95% CI: 39%–58%). However, substantial heterogeneity was observed ($I^2 = 97.15\%$, $\chi^2(21) = 737.64$, $p < 0.001$), likely reflecting differences in study populations, clinical settings, and particularly the measurement instruments used. A sensitivity analysis was conducted to evaluate the reliability of the results. The pooled prevalence remained consistent across iterations, ranging from 47% to 50%, indicating that no single study significantly impacted the overall estimate. The study by Riaz (Riaz et al., 2021) was an exception, reporting a lower prevalence; excluding this study led to a slight increase in the pooled estimate to 48%, with no change in the overall interpretation. These results confirm the stability and credibility of the meta-analysis findings. Figure 2 presents the forest plot of the included studies, while Figure 3 shows the results of the leave-one-out sensitivity analysis.

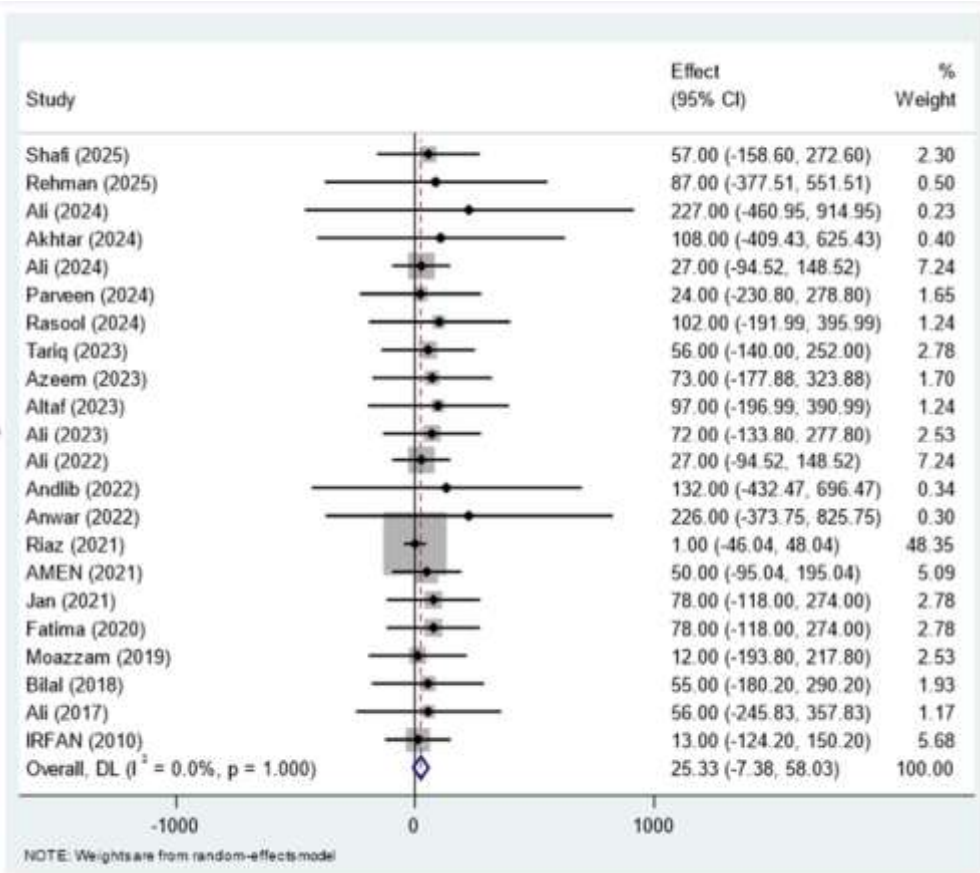


Figure 2. Forest plot of the pooled Prevalence of depressive symptoms among nursing in Pakistan

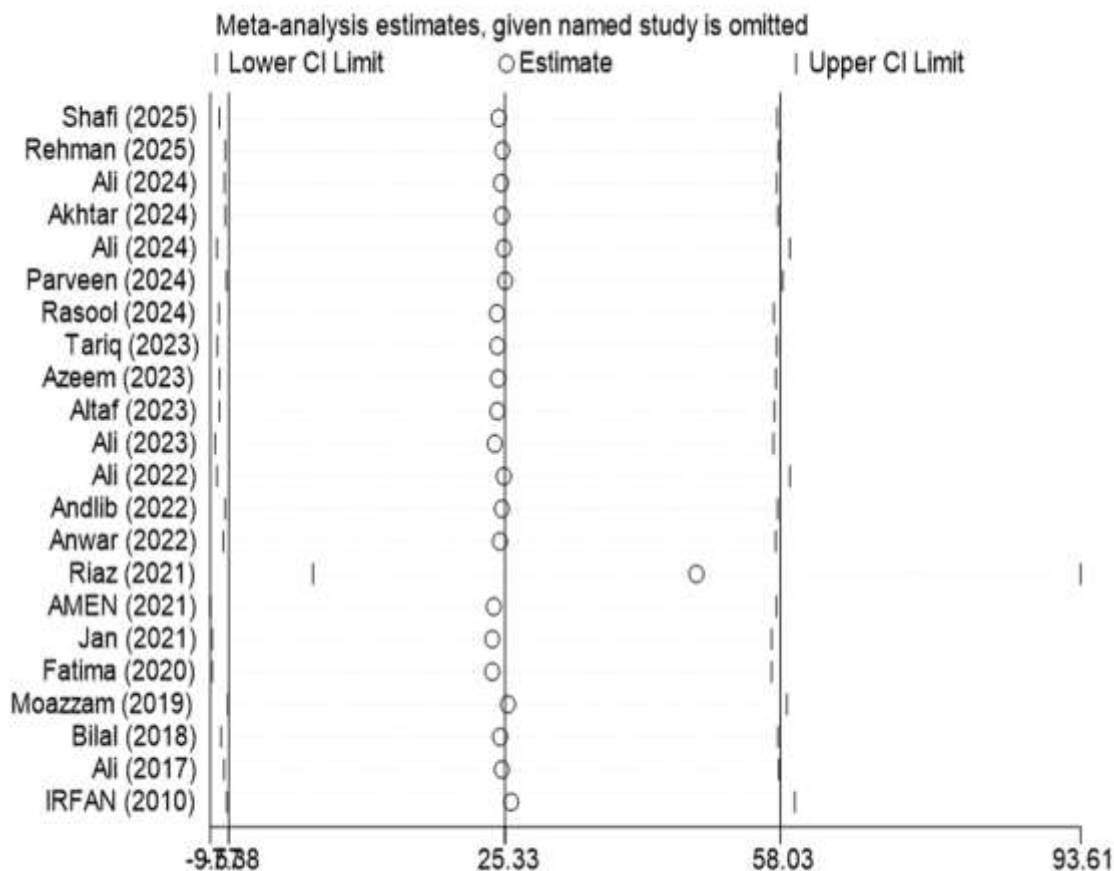


Figure 3: leave-one-out sensitivity analysis for the pooled Prevalence of depressive symptoms among nurses in Pakistan

To further explore the observed heterogeneity and improve interpretability, subgroup analyses were performed based on the type of depression assessment tool. The results showed a statistically significant difference in pooled prevalence estimates across instruments (test for subgroup differences: $\chi^2 = 7.49$, $p = 0.02$), indicating that measurement method contributed to the heterogeneity. Specifically, studies using the PHQ-9 reported a pooled prevalence of 38% (95% CI: 34%–42%) with no observed heterogeneity ($I^2 = 0\%$), suggesting strong methodological consistency. In contrast, studies using the DASS-21 showed a higher pooled prevalence of 61% (95% CI: 45%–78%) with substantial heterogeneity ($I^2 = 97.3\%$). Studies using other instruments (EPDS, BDI-II, HAM-D, GHQ-28, and STOP-D) reported a pooled prevalence of 42% (95% CI: 29%–55%), also with high heterogeneity ($I^2 = 97.0\%$). These findings indicate that differences in

measurement tools are a key source of variability, and pooled estimates should be interpreted within instrument-specific subgroups. Figure 2 presents the overall forest plot, and Figure 4 illustrates the subgroup analyses.

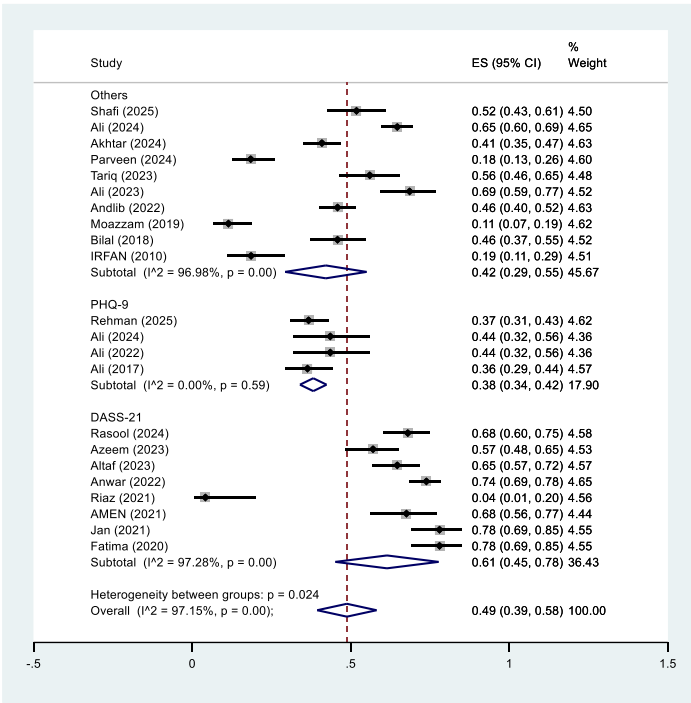
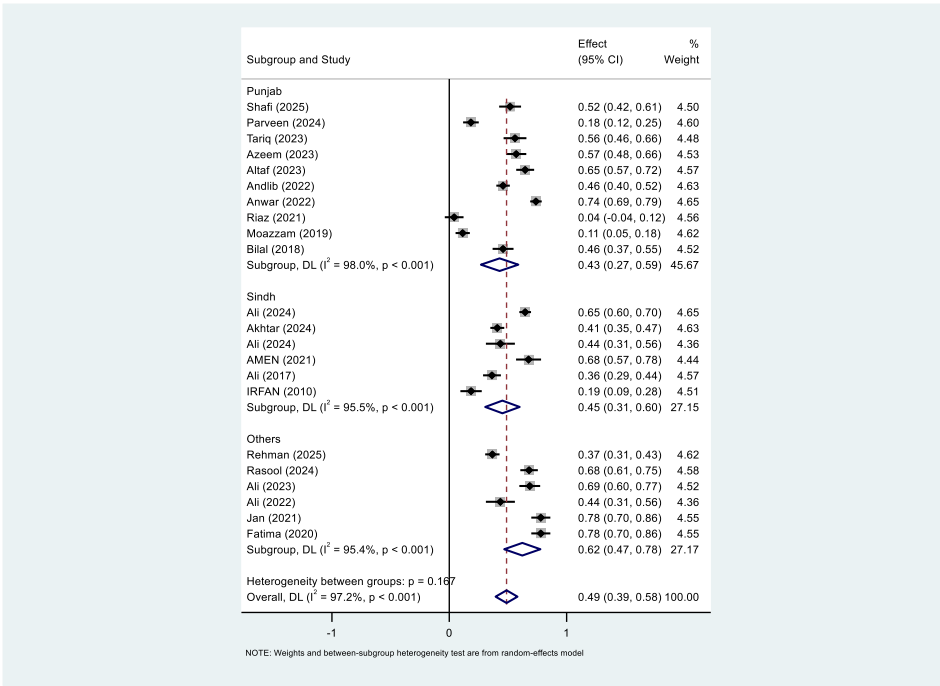


Figure 4 . Forest plot of studies stratified by depression assessment instruments

Subgroup analysis by province

To explore geographical variations in prevalence of depressive symptoms among nurses, a subgroup analysis was performed based on the province where the studies were carried out. The results revealed that studies conducted in Khyber Pakhtunkhwa (KPK) reported the highest prevalence of depressive symptoms among nurses, surpassing rates in other regions. Following KPK, moderate prevalence levels were observed in Sindh and Punjab provinces. The lowest prevalence was observed in Baluchistan; however, this estimate should be interpreted with caution, as it is based on a single study with limited statistical power. In addition, studies from regions other than Punjab and Sindh were sparse and often represented single-center investigations. Therefore, these regional findings may not be generalizable and should be considered within the context of limited available evidence. The results of the subgroup analysis by province are presented in **Figure 5.**



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Figure 5. Forest plot of subgroup analysis by province

349 **Meta-regression analysis**

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A univariate meta-regression was conducted to investigate whether the prevalence of depressive symptoms changed over time across studies published between 2010 and 2025, using the year of publication as the moderator variable. Publication year was selected because it was the only variable consistently reported across the included studies and was considered appropriate for exploring potential temporal trends in prevalence estimates. Other potentially relevant moderators, such as gender distribution, healthcare setting (public vs. private), and detailed occupational characteristics, were not reported consistently enough to permit reliable meta-regression analyses. The results showed no significant relationship between study year and the reported prevalence of depressive symptoms ($\beta = 0.020$, $SE = 0.013$, $p = 0.128$). This finding suggests that the prevalence of depressive symptoms among nurses in Pakistan did not demonstrate a clear temporal trend during the study period, indicating that time-related variation was unlikely to be a major contributor to the observed heterogeneity. It is important to note that many studies did not report the exact period of data collection and only provided the publication year. Therefore, it was not possible to accurately compare prevalence estimates before and after the COVID-19 pandemic.

Consequently, the findings are presented collectively without subgroup analyses based on time periods. Figure 6 illustrates that publication year was not significantly associated with the prevalence of depressive symptoms among nurses.

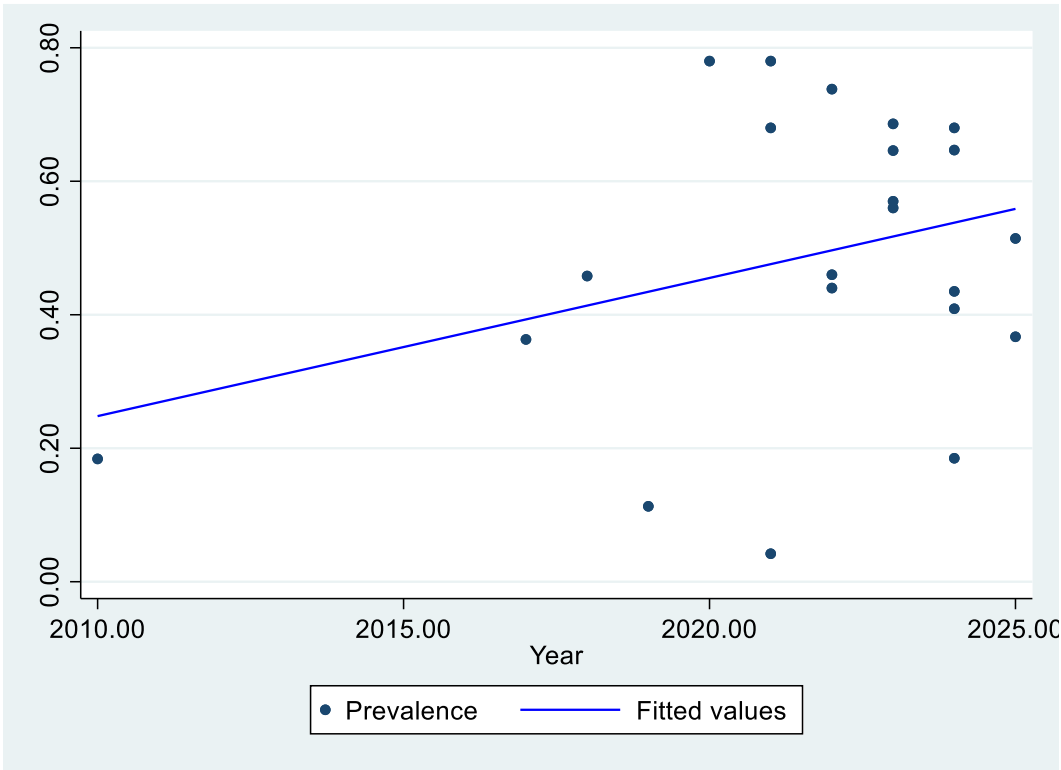


Figure 6. Meta-regression by year of study

Assessment of publication bias

Publication bias was evaluated using Begg’s rank correlation test and Egger’s regression test. The results of Begg’s test showed no significant correlation between effect size and its standard error (Kendall’s tau = 0.12, $p = 0.44$), indicating no publication bias based on this test. However, Egger’s regression test revealed a significant intercept ($p = 0.029$), suggesting potential asymmetry in the funnel plot and the likelihood of publication bias.

To further assess the impact of potential bias, the Trim-and-Fill procedure was conducted under a random-effects model (REML). The analysis did not identify any additional studies (imputed = 0),

and as a result, the adjusted pooled effect size remained unchanged ($ES = 0.49$; 95% CI: 0.40–0.58). In summary, while Egger’s test indicated possible funnel plot asymmetry, the Trim-and-Fill analysis did not support the presence of significant publication bias, indicating the stability and reliability of the pooled prevalence estimate. As shown in Figure 7, the funnel plot displays the distribution of studies for visual assessment of publication bias.

Visual inspection of the funnel plot suggested a slight asymmetry, with a tendency toward an uneven distribution of smaller studies on one side of the plot. However, this asymmetry should be interpreted with caution, as it may be influenced by substantial between-study heterogeneity ($I^2 = 97\%$) rather than true publication bias. The discrepancy between Egger’s and Begg’s tests may reflect the higher sensitivity of Egger’s test to small-study effects. Importantly, the Trim-and-Fill analysis did not identify any missing studies, supporting the robustness of the pooled estimate and suggesting that the observed asymmetry is unlikely to be solely due to publication bias.

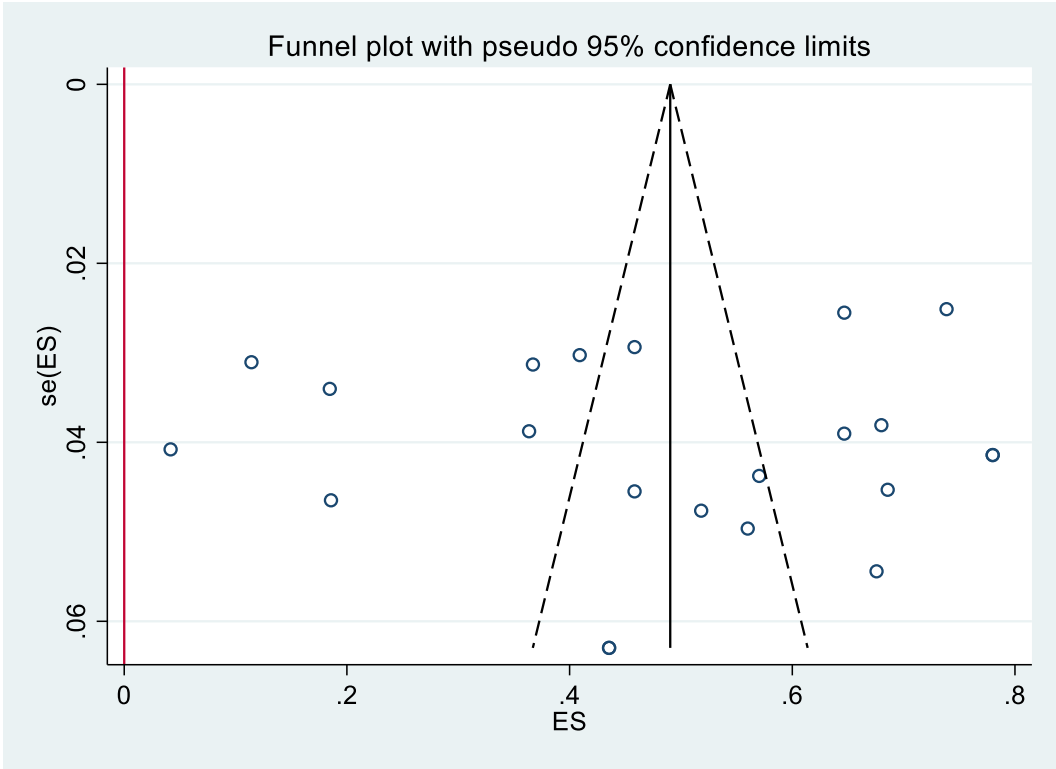


Figure 7. Funnel plot assessing publication bias among the included studies

Discussion

The systematic review and meta-analysis findings revealed a high prevalence of depressive symptoms (49%) among the nursing workforce in Pakistan, compared to the 33.03% prevalence among healthcare workers in the Eastern Mediterranean Region (Abraham et al., 2021) as well as that observed among nursing students in Pakistan (37%) (Hamideh Ebrahimi, Masoud Mohammadnezhad, et al., 2026). These differences may reflect the greater burden of depressive symptoms associated with professional responsibilities and workplace-related exposures.

Some individual studies included in this review reported that occupational and workplace-related factors, such as heavy workload, staff shortages, and irregular shift schedules, may be associated with depressive symptoms among nurses (Ali et al., 2024; Rasool & Tareen). Parveen et al.'s study in Lahore found that financial insecurity, inadequate salary, and dual responsibilities at work and home were associated with higher levels of depression, especially among female nurses (Parveen et al., 2024). Additionally, Bilal et al. reported that lack of organizational support, exposure to workplace violence, and limited professional advancement opportunities were predictors of depressive symptoms among nurses in Punjab (Bilal et al., 2018). These findings suggest that depressive symptoms among nurses in Pakistan may be influenced by various factors within the healthcare system, workplace conditions, and socio-economic context. Collectively, these findings highlight the potential importance of organizational and systemic interventions, including improved staffing policies, organizational support, fair compensation, and professional development opportunities, rather than relying solely on individual-level interventions. In addition, the subgroup analysis suggested that the type of depression assessment instrument may substantially influence the reported prevalence estimates. (Hamideh Ebrahimi, Rashida Bibi, et al., 2026; Levis, Yan, et al., 2019). Studies that employed the PHQ-9 reported a pooled prevalence of 38%, with no observed heterogeneity ($I^2 = 0\%$), whereas studies utilizing the DASS-21 demonstrated a markedly higher pooled prevalence of 61%, accompanied by very high heterogeneity. Studies using other instruments, including EPDS, BDI-II, HAM-D, GHQ-28, and STOP-D, reported an intermediate pooled prevalence of 42%, with similarly high heterogeneity observed in this subgroup. Only one study used the clinician-administered HAM-D, and no parallel self-report measure was used in that study. This limits any meaningful comparison between clinician-rated and self-reported assessments. The study using the EPDS involved a specific subgroup of pregnant nurses, which should be considered when comparing its prevalence estimate with those obtained using general depression screening instruments (Shafi et al., 2025b).

The role of culture in the observed findings remains unclear. The studies included in this review did not provide sufficient information on cultural factors to examine their influence on depressive symptoms (Daraz et al., 2025). For this reason, the differences observed across provinces cannot be attributed to cultural differences. Further research across different regions of Pakistan is needed to determine whether cultural and social factors influence the experience and reporting of depressive symptoms among nurses.

Age may be an important consideration when identifying nurses at greater risk of depressive symptoms. In the study by Akhtar, age was significantly associated with depression, with nurses aged 25–29 years showing a higher prevalence than older age groups. This finding deserves particular attention because poor mental health early in a nursing career may affect nurses' ability to adapt to workplace demands and may ultimately influence their decision to remain in the profession (Nimra Akhtar et al., 2025). Similar concerns have been reported among young nurses in China. Chen et al. found that job stress was linked to depression in young nurses through several psychosocial pathways, with emotional exhaustion and social support playing particularly important roles (Chen et al., 2020). These findings point to the value of providing greater support to nurses during the early years of their careers. Measures such as workplace mentoring, stronger social and organizational support, and efforts to reduce excessive job stress and emotional exhaustion may help protect the mental health of younger nurses and, in turn, support their longer-term retention in the nursing workforce.

In contrast, evidence from studies on nursing students in Pakistan suggests that differences in prevalence estimates across measurement tools were not statistically significant (Hamideh Ebrahimi, Masoud Mohammadnezhad, et al., 2026). This discrepancy may reflect differences in study populations, variations in how depressive symptoms are assessed in clinical versus academic settings, as well as differences in the nature of activities and stressors associated with each context. Furthermore, the broader conceptualization of depressive symptoms in instruments such as the DASS-21 may contribute to higher prevalence estimates compared to more focused screening tools such as the PHQ-9.

These findings suggest that the measurement tool used may substantially influence the estimated prevalence of depressive symptoms. It is important to note that the PHQ-9 is primarily a screening instrument designed to assess the severity of depressive symptoms rather than to establish a clinical

diagnosis. Therefore, variations in PHQ-9 cut-off points across studies may contribute to differences in reported prevalence estimates among general or occupational populations (Kroenke et al., 2001; Levis, Benedetti, et al., 2019).

On the other hand, the DASS-21 defines depressive symptoms in terms of reduced positive affect, anhedonia, hopelessness, and low activation, which represents a broader operational definition of depressive symptoms compared to instruments such as the PHQ-9. Therefore, the use of DASS-21 may partly explain the higher prevalence estimates observed in some studies (Parkitny & McAuley, 2010).

An important source of heterogeneity may be the variability in cut-off points applied across studies, even when the same assessment instruments were used. Differences in threshold definitions, particularly regarding whether mild symptom categories were classified as indicative of depressive symptoms, may have influenced the reported prevalence estimates and introduced potential misclassification. A similar pattern has also been observed in previous systematic reviews examining the prevalence of depressive symptoms among nursing and medical students in Pakistan (H Ebrahimi et al., 2026; Ebrahimi & Irshad, 2026).

One of the included studies used a self-developed, non-validated instrument to assess depressive symptoms, which may represent a potential source of heterogeneity. However, the leave-one-out sensitivity analysis demonstrated that exclusion of this study did not materially affect the pooled prevalence estimate, suggesting that its influence on the overall findings was minimal. Nevertheless, the use of non-standardized or non-validated instruments may still contribute to measurement inconsistency and increased heterogeneity across studies (Tariq et al.).

The meta-regression analysis in this study found no significant association between the year of the studies and the reported prevalence of depressive symptoms among nurses in Pakistan. This finding may suggest that depressive symptoms among nurses represent a persistent concern that may not be substantially influenced by short-term temporal fluctuations. This aligns with a previous systematic review which also found that the publication year did not predict the prevalence of depressive symptoms among nurses in various countries (Shahri et al., 2017). The persistence of depressive symptoms among nurses may be associated with chronic occupational stressors, including heavy workloads, staff shortages, and burnout, which have been consistently reported across studies over time (Letvak et al., 2012; Tariq et al.). While some studies have shown

an increase in depressive symptom prevalence among nurses following the COVID-19 pandemic, the overall trend suggests that depressive symptoms among nurses are more closely associated with healthcare system factors rather than short-term temporal fluctuations (Ali et al., 2023; Pappa et al., 2020).

While Begg's test did not indicate publication bias and the Trim-and-Fill analysis did not identify missing studies, the significant intercept observed in Egger's test suggested potential funnel plot asymmetry. This inconsistency may partly reflect differences in the characteristics and methodological quality of the included studies. In addition, although several studies were retrieved from major indexed databases such as MEDLINE, Embase, and Web of Science, a considerable proportion were identified through Google Scholar, which includes a broad range of indexed and non-indexed academic sources. Therefore, although the Trim-and-Fill analysis suggested that the pooled prevalence estimate remained stable, the possibility of publication bias or small-study effects cannot be completely excluded, and the findings should be interpreted with caution.

Limitations and Future Recommendations

Limitations and Future Recommendations

Several limitations should be considered when interpreting the findings of this review. Many of the included studies did not report their data collection periods in sufficient detail, making it difficult to compare the prevalence of depressive symptoms across different time periods, particularly before and after the COVID-19 pandemic. Information on healthcare settings was also often incomplete. In particular, several studies did not specify whether nurses worked in public or private facilities or report findings separately by setting. Differences in workload, staffing, resources, and organizational support across these settings may be relevant to nurses' mental health, but their contribution could not be examined in this review.

Gender-specific prevalence estimates were also rarely reported, preventing stratified analyses and limiting our ability to examine whether prevalence differed by gender. The heavy reliance on self-report measures presents another concern. Nurses working under considerable stress may experience temporary negative emotions, including sadness, that can influence how they respond to symptom questionnaires. Negative cognitive states may similarly affect self-reported responses

(Beck et al., 2024). For this reason, elevated scores in the included studies should be understood as evidence of depressive symptoms rather than a clinical diagnosis of depression.

Future studies would benefit from clearer reporting of data collection periods, healthcare settings, gender-specific outcomes, and other factors that may explain variation in depressive symptoms. Combining self-report measures with clinical assessment, when feasible, may also provide a clearer picture of depressive symptoms among nurses.

Conclusion

This systematic review and meta-analysis highlighted that depressive symptoms are a prevalent and ongoing concern among nurses in Pakistan, with factors such as working conditions, staff shortages, occupational stress, and lack of organizational support playing a significant role. The study also emphasized the impact of the choice of depressive symptoms assessment tool on prevalence rates. To address this issue, it is crucial to implement organizational and policy changes, such as improving working conditions, enhancing professional support systems, and ensuring job stability for nurses. Future research should provide detailed information on data collection periods and healthcare facility types (public vs. private) while using standardized depressive symptoms assessment tools.

Declarations

Ethics approval and consent to participate

This study was a systematic review and meta-analysis based exclusively on data from previously published studies. No new data were collected from human participants, and no direct contact or intervention involving human subjects was conducted. Therefore, ethical approval was not required for this study. Informed consent was also not required because the study analyzed data from previously published research and did not involve the recruitment of human participants. All studies included in this review were expected to have been conducted in accordance with the ethical standards of the responsible institutional and/or national research committees and with the principles of the Declaration of Helsinki.

Consent for publication

542 Not applicable.

543 **Data availability**

544 The datasets analyzed during the current study are available from the corresponding author upon
545 reasonable request.

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547 **Competing Interests**

548 The authors declare that there are no conflicts of interest related to the authorship or publication
549 of this article

550 **Authors' contributions**

551 XX and XX conceptualized the study question and designed the study protocol. XX and XX
552 independently performed the study screening, selection, data extraction, and quality assessment,
553 with XX acting as the third reviewer in cases of disagreement. All authors read and approved the
554 final version of the manuscript.

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556
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561

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